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## **The £ for lb. Challenge. Evaluation of a novel, workplace-based peer-led weight management programme, 2014-2016**

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**The £ for lb. Challenge. Evaluation of a novel, workplace-based peer-led weight management programme, 2014-2016.**

**Word Count:** 2998 (Max 3000)

## **Abstract**

Objectives: To evaluate the *£ for lb. Challenge*, a novel country-wide, workplace-based, peer-led weight management programme with participants from a range of private and public organisations in Northern Ireland (NI).

Study design: Pre-and-post intervention studies.

Methods: The intervention was workplace-based, led by volunteer co-worker champions and based on the NHS Choices 12-week weight loss guide which incorporates dietary advice, physical activity, behaviour change methods and weekly weight monitoring. It operated from January to April in three consecutive years (2014-16). Overweight and obese adult workers were eligible. Training of peer champions involved two half day workshops delivered by dietitians and physical activity professionals. Employers and/or participants pledged £1 to charity for every pound of weight lost. Weight was reported at enrolment and at either 12 weeks (2014) or at 12 weekly intervals (2015-16). Changes in weight and % weight, and Body Mass Index (BMI) were determined for all participants and for gender and deprivation subgroups.

Results: There were 734, 1559 and 1513 eligible participants and 21, 31 and 35 participating companies in 2014, 2015 and 2016 respectively. Engagement rates were 94% and 96% and completion rates were 70% and 71% in 2015 and 2016 respectively. Mean weight loss was 1.9kg (2.2%; 2014), 2.5kg (2.8%; 2015) and 2.4kg (2.7%; 2016). The proportions losing  $\geq$  5% initial bodyweight were 21% (2014), 24% (2015) and 26% (2016). Male participants were more than twice as likely as women to complete the programme (odds ratio (OR) 2.5 (2015); 2.2 (2016)) and to lose  $\geq$  5 % body weight (OR 2.5 (2015); 3.7 (2016)).

Conclusions: The *£ for lb. Challenge* was an effective, low cost health improvement intervention with meaningful weight loss for many participants, particularly male workers. With high levels of engagement and ownership, and successful collaboration between public health, voluntary bodies, private companies and public organisations it is a novel workplace-based model with potential to expand.

Abstract word count: 313

**Key words:** obesity, weight loss, workplace, peer-led

## **Introduction**

Tackling obesity is a public health priority. Serious long-term physical and mental health problems and early death are caused by being overweight or obese <sup>1</sup>. Excess weight is associated with increased risk of type 2 diabetes, heart disease, stroke, osteoarthritis, several cancers and depression <sup>2,3</sup>. In Northern Ireland (NI), 60% of adults were reported to be overweight (34%) or obese (26%) <sup>4</sup>. The workplace has been recognised as a health promoting setting <sup>5,6</sup> and workplace programmes targeting physical activity and diet may be effective in changing lifestyle behaviours, improving health-related outcomes (e.g. reduced Body Mass Index (BMI), blood pressure and other cardiovascular disease risk factors) <sup>7</sup>. They may also be associated with organizational-level benefits such as reduced absenteeism, enhanced productivity and improved corporate image <sup>7</sup>. Employers are increasingly recognizing the competitive advantages a healthy workplace provides <sup>5</sup>. Although there is evidence that workplace based and nutrition and physical activity interventions are effective in achieving weight loss, conflicting results have also been reported <sup>8-10</sup>. To the best of our knowledge, this is the first report of evaluation (using UK department of Health guidelines<sup>11</sup>) of a peer-led workplace-based weight loss programme that is compliant with NICE Public Health Guideline PH53 <sup>12</sup>. The low-cost intervention, which included the use of freely-available NHS Choices written materials and pragmatic evaluation of effectiveness could be readily implemented in other areas. The *£ for lb. Challenge* was a novel, country-wide, workplace-based, peer-led weight management programme which operated annually for three years (2014 to 2016). It was led by Business in the Community Northern Ireland (BITCNI) (a not-for-profit corporate responsibility membership organisation) in partnership with the Public Health Agency (PHA), the regional organisation for health and wellbeing improvement in NI. This study assessed the effectiveness of the programme and analysed

individual-level demographic and socio-economic factors associated with programme completion and weight loss.

## **Methods**

### **Intervention**

The aim of the intervention was that overweight or obese adult participants would achieve safe and sustainable weight-loss by dietary change and physical activity. The intervention was workplace-based and led by volunteer peer champions. It was based on the NHS Choices 12-week weight loss guide (*Losing Weight: Getting Started*), which is a behavioural weight management programme for adults with a BMI  $\geq 25\text{kg/m}^2$  who are not pregnant<sup>13</sup>. Participants with a pre-existing medical condition were advised to consult their general practitioner before commencing. The programme includes healthy eating, physical activity and behaviour change advice. Advice on diet and weight loss was given in line with the NHS Choices 12 week programme (a 600 calorie deficit diet for most participants) and the UK chief medical officers' physical activity recommendations (at least 30 minutes of physical activity, five times per week) and is in line with The National Institute for Health and Care Excellence (NICE) Public Health Guideline Weight management: lifestyle services for overweight or obese adults<sup>12</sup>. However, the champions were not expected to give personalised advice such as might be delivered by a qualified, registered health professional. The champions were instructed to advise participants with special circumstances (should these be specified?) to consult with an appropriate health professional. The programme booklet included a daily calorie and physical activity diary with practical strategies for reducing calorie intake and increasing physical activities. Resources were provided to champions for printing or electronic sharing. The 12 week weight loss guide provided as a paper booklet to participants in 2104 and in electronic format in 2105 and 2016. All participants met the peer champions at enrolment and at each weight in, which occurred weekly. Fidelity to the fundamental intervention was important but organisations had freedom to arrange their own weekly sessions in a way that suited the working patterns of

their staff members. Most organisations arranged weekly group weigh-in sessions, but for some organisations with more flexible individual arrangements were made to accommodate participants, such as those who worked night shifts, who worked peripatetically or on peripheral sites.

The program was administered by Business in the Community Northern Ireland (BITCNI) which is a membership organisation for companies committed to corporate responsibility, doing business responsibly and working on societal issues. BITCNI sent an email invitation to its member organisations from the private and public sectors to participate in the programme and the organisations volunteered to participate. Participant recruitment in each organisation was determined by each organisation champion, although BITCNI provided information packs to all champions to assist with recruitment. This usually involved an email sent by the champion to all staff within the organisation inviting them to the enrolment and initial weigh-in event. BITCNI provided supportive and motivational messages in weekly emails to champions, which were shared with participants and which aligned with weekly themes in the programme booklet.

Weight loss was incentivised by the organisation, the participant or both, pledging £1 to a relevant charity for every 1 lb. (or 0.5kg) of weight loss achieved and prizes awarded to organisations and participants at annual end of programme celebration events. In practice non-public sector organisations provided the contribution to match workers weight loss with workers sometimes supplementing this with personal contributions, while in public sector organisations workers raised the money themselves as employers would not have been allowed to contribute. In all cases the money was raised for a local charity of the workers choosing. As this was a peer-led intervention the amount raised and the charity chosen was determined by the workers of the individual organisation. However, the breakdown of contributions between the organisation and participants was not recorded. Training of peer



champions involved two half-day workshops (before commencement and midway through the programme) delivered by dietitians and physical activity professionals from a local Health and Social Care Trust. They delivered presentations about healthy eating, physical activity and weight loss and how to measure participants' weight and height, with identical presentations given to all workplace champions from all organisations. During training champions were advised on how to weigh participants on calibrated scales. The programme operated from January to April in three consecutive years (2014-2016). Overall goal setting of 0.5kg to 1kg weight-loss each week was used and weekly feedback was given at weekly weigh-in sessions organised by workplace champions. Participants were weighed individually within the workplace on a specified day and time each week for 12 weeks, but the location of this was determined by individual workplace champions. BITCNI provided supportive and motivational generic messages in weekly emails to champions, which were shared with participants and which aligned with weekly themes in the programme booklet. An example is shown in Supplementary materials.

### Settings

BITCNI invited its member organisations from private and public sectors in Northern Ireland to participate in the programme. Workplace champions were mostly employee volunteers but a small number were nominated as their job role included a responsibility for health and wellbeing of staff.

### Data collection and quality control, analysis and statistical methods

Demographic details and physical measurements were recorded by each champion on paper in 2014 and in a custom-made Microsoft Excel spread sheet in 2015 and 2016. Weight was measured at enrolment and at either 12 weeks (2014) or at 12 weekly intervals (2015-16). At the end of the programme, pseudonymised (2014) or anonymised (2015-16) data were

submitted to PHA for evaluation. Outlying data points were examined and either corrected (where imperial units had obviously been used) or excluded from analyses where the data was implausible and likely to be an error. Participants with missing age were assumed to be adults and included in the evaluation. Limited data collection in 2014 precludes calculation of engagement and completion rates for that year.

Analysis was undertaken according to UK Department of Health (DOH) recommendations for evaluation of Tier 2 weight management services <sup>11</sup>. These recommend categorisation of participants as enrolled, engaged (attended at least one session) and completed (attended any of last three sessions). Baseline weight and BMI, change in weight and BMI, % weight change and the proportion losing  $\geq 5\%$  bodyweight were calculated for the total cohorts and for sex and deprivation subgroups for each year. Deprivation level was determined based on the census output area of the participants home postcode, using the Northern Ireland Multiple Deprivation Measure (NIMDM) which is a composite deprivation measure with components of income, employment, health and disability, education, skills and training, proximity to services, living environment and crime and disorder . Patients were assigned to deprivation deciles according to their area of residence, ranging from decile 1 (most deprived) to decile 10 (least deprived) <sup>14</sup>. Analyses were conducted using the conservative Baseline Observation Carried Forward (BOCF) method <sup>11</sup>, meaning if an engaged participant did not attend the final 12 week weigh-in, their weight was assumed to have remained unchanged throughout the programme, regardless of weight loss achieved in earlier recorded weights. Categorical variables were compared using Pearson's Chi-squared test and continuous variables using Student's T test. Logistic regression was used to investigate factors associated with completion and loss of more than 5% of bodyweight. Multivariate linear regression was used

to investigate factors associated with weight loss. Analysis was conducted in IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.

## **Results**

### **Baseline characteristics**

The numbers of eligible enrolled participants was 734 (21 companies), 1559 (31 companies), and 1513 (35 companies) in 2014, 2015 and 2016 respectively (Table 1). The proportion of male participants was 45%, 40% and 45% in 2014, 2015 and 2016 (Table 1). The numbers of participants with missing gender, age, deprivation decile and BMI in each year are shown in Table 1. The mean age of participants was 42.2 years (2014), 42.2 years (2015) and 44.3 years (2016) and there was no significant difference between the mean age of genders (Table 1 and S1). Mean baseline BMI was 31.0kg/m<sup>2</sup>, 30.9kg/m<sup>2</sup> and 29.9kg/m<sup>2</sup> in 2014, 2015 and 2016, and there was no significant difference between genders in baseline BMI (Table 1 and S3). The greatest proportion of participants was overweight at baseline (49%, 52% and 54%) (Table 1 and S3). A lower proportion of men were overweight at baseline (43%, 48% and 51%) compared to women (55% in each year) and a higher proportion of men were Class 1 obese at baseline (42%, 37% and 38%) compared to women (29%, 27% and 26%) (Table 1 and S3).

### **Engagement and completion**

In 2015 and 2016, participant engagement rates were 94% and 96% and completion rates were 70% and 71%, respectively. The proportions attending the final 12 week session were 39%, 67% and 65% in 2014, 2015 and 2016 (Table 2). A significantly higher proportion of males than females completed the programme (Male:Female 79%:64% in 2015 and 79%:63% in 2016) and attended the last session (Male:Female 77%:61% in 2015, and 74%:56% in 2016) (Table 2).

### Factors influencing completion

Males were more than twice as likely to complete the programme compared to females in 2015 and 2016 (OR 2.5 (1.9 – 3.3) and 2.2 (95% CI 1.7 – 2.9) for 2015 and 2016, Table 3). Age, baseline BMI and deprivation decile were not significantly associated with completion in 2015 or 2016. Higher baseline weight was associated with a marginally lower rate of completion in 2015, (OR 0.989 (0.982 – 0.997), Table 3) but there was no association in 2016.

### Effectiveness - Weight and BMI change

Mean weight loss at 12 weeks, using BOCF, was 1.9kg, 2.5kg and 2.4kg, and mean percentage weight loss was 2.2%, 2.8% and 2.7%, in 2014, 2015 and 2016. Mean reduction in BMI was 0.67kg/m<sup>2</sup>, 0.87kg/m<sup>2</sup> and 0.81kg/m<sup>2</sup> in 2014, 2015 and 2016. Reductions in weight, percentage weight loss and reductions in BMI were all significantly greater for male workers compared to females (Table 2).

The proportion of participants losing at least 5% bodyweight was 20.0%, 24.1% and 25.4% in 2014, 2015, 2016. A greater proportion of male than female participants lost at least 5% bodyweight in each year of the challenge (Male:Female, 29%:14% ( $p=6.1 \times 10^{-6}$ ), 35% :18% ( $p=8.9 \times 10^{-14}$ ), 36%:17% ( $p=1.0 \times 10^{-13}$ ) in 2014, 2015, 2016). Male gender was associated with an odds ratio of 3.7 (95% CI 2.3 – 4.9), 2.5 (95% CI 1.9 – 3.2) and 2.7 (95% CI 2.0 – 3.4) that a participant would lose at least 5% of their starting bodyweight compared to females in 2014, 2015 and 2016 (Table 3). Age, baseline BMI and deprivation decile were not significantly associated with losing at least 5% bodyweight in any of the years.

There were significant differences in outcomes between deprivation deciles, with the least deprived having the lowest mean weight loss (1.6kg,  $p = 0.0002$ ), percentage weight loss (1.8%,  $p = 0.002$ ) and BMI loss (0.55kg/m<sup>2</sup>  $p = 0.002$ ) compared to the middle deciles (5, 6

and 7) which had the highest mean weight losses (3.0kg, 3.2kg, 2.5kg), percentage weight losses (3.6%, 3.7%, 3.4%) and BMI losses (1.0kg/m<sup>2</sup>, 1.1kg/m<sup>2</sup>, 0.9kg/m<sup>2</sup>) respectively.

In linear regression modeling gender was the greatest independent predictor of % weight loss, with males losing on average 1.7% more bodyweight in both 2014 and 2015 and 1.4% more bodyweight in 2016 (Table 3) compared to females. Deprivation decile was an independent predictor of % weight loss in 2016, with an average difference of 0.08 % between deciles, but not in 2014 and 2015. However, while there was a trend for greater weight loss in more deprived groups, greatest weight loss occurred in mid deprivation deciles (Decile 6) (Figure 1). One way Analysis of variance (ANOVA) with post hoc testing (Tamhane's test, assuming unequal variance) found greater percentage weight loss for participants in decile 6 (3.6%) compared to deciles 9 (1.9% (difference = 1.7%,  $p = 0.01$ ) and 10 (mean 1.8% (difference = 1.8%,  $p = 0.006$ ) but no other differences between deciles.

## **Discussion**

The workplace is a potentially useful setting to deliver programmes to reduce obesity and prevent weight gain <sup>15</sup> and a considerable proportion of adults can be reached through workplace interventions <sup>16</sup>. A systematic review of combination nutrition and physical activity interventions in the workplace by the United States Preventative Services Task Force (USPTSF) found sufficient evidence of effectiveness with a pooled effect weight loss of 2.2kg (range 2kg to 14kg) <sup>9</sup>. In another systematic review of workplace nutrition and physical activity programmes Anderson *et al* report modest reductions in weight (1.27kg) and BMI (0.47kg/m<sup>2</sup>) at 6–12-month follow-up in both male and female employees across a range of worksite settings <sup>8</sup>. In our study mean weight loss was 1.9kg, 2.5kg and 2.4kg and mean BMI loss was 0.67kg/m<sup>2</sup>, 0.87kg/m<sup>2</sup> and 0.81kg/m<sup>2</sup> over the three consecutive years of the programme, which are greater losses than those reported in systematic reviews by Katz *et al* <sup>9</sup> and Anderson *et al* <sup>8</sup>, though at shorter term follow-up.

More recent workplace based studies also report conflicting results. In a workplace nutrition and physical activity intervention in a German logistics company <sup>10</sup> no significant weight loss (overweight group lost 0.32kg/m<sup>2</sup>) occurred following a one year multi-component intervention involving weekly physical activity training and personalised nutrition counselling. Three months following a workplace-based intervention in Danish care workers, mean weight loss was 3.6kg, although all participants were female and cognitive behavioural training during working hours was provided as well as dietary and physical activity aspects <sup>17</sup>. A voluntary 10-week workplace weight loss programme based on a commercial high protein diet and involving 93 companies and 3880 participants in the USA, found that women lost 4.3kg (4.8%) and men lost 5.9kg (5.8%) <sup>18</sup>, which are greater losses than found in our intervention. However, Earnest *et al* reported on those completing the programme and used

last observed carried forward (LOCF) weight as their main summary measure <sup>18</sup>. Mean weight loss and % weight loss in our intervention was less than that reported in a systematic review of community based weight loss programmes <sup>19</sup>, which reports mean weight loss of 5 to 8.5kg (5% to 9%) at six month follow-up, although these interventions were not workplace-based and included reduced-energy diets and weight-loss medications.

Some workplace-based studies report significant weight reduction while others do not. This may be due to differences in interventions delivered and measurement and reporting of outcomes, with most studies reporting weight-loss of completers only and using LOCF weight. Consequently it was difficult to find directly comparable studies, partly due to the novelty of our programme (delivery by trained workplace champions and charitable incentive) and use of BOCF weight to assess outcomes. Applying LOCF rather than BOCF measures, mean weight loss was 5.9kg (5.4%), 3.8kg (4.2%) and 2.8kg (3.2%) in 2014, 2015 and 2016. The large difference between weight loss using BOCF and LOCF in 2014 was due to the low % attending the last session (39%). Furthermore mean weight loss in those who completed by LOCF in 2016 was 3.5kg (4%) which is similar to Christensen et al <sup>17</sup>.

It is suggested the effects of workplace health interventions may be improved with better adherence to established quality criteria for such interventions <sup>20</sup>. In our intervention we used UK DOH best practice guidance for evaluation of Tier 2 weight loss programmes <sup>11</sup>. UK DOH recommends that, for participants attending at least one session, mean weight loss is  $\geq 3\%$  baseline bodyweight and at least 30% achieve % weight loss (by BOCF method) <sup>11</sup>. In our intervention mean weight loss was 2.2%, 2.8% and 2.7% in the three years of the programme, which is just below this recommended threshold. The proportion of participants losing  $\geq 5\%$  bodyweight was 20.0%, 24.1% and 25.4% in 2014, 2015, 2016.



In another systematic review and meta-analysis of interventions designed to improve nutrition and physical activity in the workplace<sup>21</sup> Hutchinson *et al* found studies that targeted more than one health behaviour (e.g. diet and physical activity) had smaller effect sizes than those focused on one area of behaviour change. However Katz *et al*<sup>9</sup> found multi-component workplace based interventions effective in reducing weight and NICE<sup>12</sup> recommend multi-component weight management services for overweight and obese adults. Robroek *et al.* found interventions targeting multiple behaviours attracted more participants than those focused only on physical activity<sup>22</sup> and it is suggested there may be a trade-off between maximising participant numbers and maximising health behaviour changes (e.g. weight loss, physical activity and reductions in blood pressure and cholesterol)<sup>21</sup>. Previous workplace studies report large variability in attrition/dropout rates ranging from 2% to 82%<sup>9</sup>. In our intervention advice on both diet and physical activity was provided by champions and dropout rates were relatively low at 29% and 30% in 2015 and 2016. It is likely those who did not complete the program were less successful in losing weight. However, in line with recommendations on evaluation of Tier 2 programs, weight loss was determined using data at 12 weeks and these measurements were not available for those who did not complete the program<sup>11</sup>. This means that we assumed that all individuals with missing data at week 12 had no change in weight (even where we knew they had lost weight in earlier weeks). This is highly conservative, making it likely that the effectiveness that we report is an underestimate. Engagement and completion rates were not calculated in 2014 as weekly measurement were required for this, but measurements were only taken at enrolment, week 6 and week 12. This was rectified in 2015 and 2016 when weekly weights were recorded. The % attending the final 12 week weight in 2014 (39%) was much less than in 2015 (67%) and 2016 (65%). It is thought that better awareness of the program in 2015 and 2016 may have been a reason for this, but this was not assessed.

The marked gender difference in effectiveness of the *£ for lb. Challenge* suggests it maybe more suited to males than females. It may follow that either modifications are required to improve outcomes in women or alternative programmes specifically targeted at women are developed. It has been suggested that workplace based weight loss programmes may be more effective in males <sup>23</sup>. However a workplace based intervention focused on male workers in New Zealand found no difference in BMI change between intervention and control group, despite improved nutrition knowledge, reduced fat intake, increased vegetable intake and physical activity <sup>24</sup>. Workplace based weight-loss programs that are led by peers rather than professionals have potential to reach large number of workers at relatively low cost. However, though this complex intervention ‘bundle’ was effective for men, it was not effective for women at the levels specified by the Department of Health in its criteria for commissioners<sup>11</sup>. This suggests a need for further development work to ensure an equitable approach to delivery of workplace based weight management interventions.

In 2014, those with higher baseline weight were found less likely to lose 5% bodyweight during the programme. However, the effect was very small with those of higher starting weight only 3% less likely to lose 5% bodyweight. This finding was not replicated in subsequent years (2015, 2016). Although in 2015, those with higher baseline weight were found less likely to complete the programme, this result was marginal (1% less likely) and was not replicated in 2016. In 2016 deprivation decile was an independent predictor of % weight loss with a participant from the most deprived area predicted to lose 0.8% more baseline bodyweight than a participant from the least deprived area. However, in 2014 and 2015 there was no independent association between deprivation decile and % weight loss.

### Limitations:

We did not measure weight loss in the medium to long-term (i.e. after 12 weeks) and there is strong evidence that weight regain occurs after lifestyle weight management programmes, and this has been estimated at an average rate of 0.047kg/month<sup>25</sup>. As there was no ongoing follow-up after this intervention it is likely that weight loss would not have been sustained in the longer term. Further follow-up would be necessary to determine whether these changes can be maintained in the long term. However, even very small weight reductions in the longer term following lifestyle weight management programmes offer health and economic gains<sup>26,27</sup>. As some companies supported the programme in more than one year, it is possible that some individuals participated in the intervention more than once. However the extent of this is unknown as data was anonymised and individual records could not be linked between years. Although BMI is a commonly used anthropometric index of adiposity and is recommended for evaluation of Tier 2 level services<sup>11</sup>, there are other measures (e.g. waist circumference, weight to hip ratio, weight to height ratio and bioelectrical impedance) which better measure adiposity, and particularly abdominal adiposity, and better predict obesity-related disease and survival<sup>28–30</sup>. We used BMI to align with UK Department of Health advice on evaluation of Tier 2 lifestyle based weight management services<sup>11</sup> and because of the need to use a measure that could be derived from simple measurements taken by trained lay-people with simple and low-cost equipment.

This study was a real-world observational evaluation of the implementation of a weight management programme which had novel aspects, but which was fundamentally based on existing evidence that multi-component lifestyle weight management programmes consisting of dietary restriction, physical activity and behaviour change strategies, are an effective and

safe method of weight loss <sup>12</sup>. The study was a pragmatic, real-world implementation study without a control group and consequently causal effects cannot be concluded as they could from a randomised trial. However, a major systematic review and meta-analysis of randomised trials that informed the development of NICE Public Health Guidance PH53 concluded that multi-component weight management programmes were effective and cost-effective <sup>12</sup>. The purpose of our evaluation was to measure the effects of a proven treatment (multi-component weight management programmes) delivered in a novel way, in specific settings, to a real-world population. The findings of our evaluation of this intervention in diverse workplace settings cannot be generalised beyond the self-selected, motivated, volunteers who chose to participate in this weight management programme. We have no information about the numbers or characteristics of other staff who chose not to take part.

Mean and % weight loss were just below that recommended for 12 weeks programs using criteria specified by the UK Department of Health. As the program provided generic rather than individualised advice and was open to all workers regardless of motivation, a more intensive or targeted approach may achieve better results. For example while the intervention was effective for men, using the criteria specified by the UK Department of Health, it was not effective for women <sup>11</sup>, suggesting that more intensive input for female workers may be required. However, this would probably require extra resources and may require a professional rather than a peer led program.

### Benefits:

This intervention was novel in that volunteer champions, rather than healthcare professionals, delivered the programme in their own workplace, and that a charitable donation, rather than

incentives to the participants, was offered. Both of these aspects of the intervention were reported as powerful motivators by participants, although their effects were not formally quantified. As the programme was delivered by workplace volunteers the cost of the programme was low and indeed money was raised for charity. Direct health-system costs of £10,000 were shared between PHA and a not-for-profit corporate health insurance provider. BITC staff costs were not measured but were unlikely more than £10,000, meaning total costs were unlikely more than £20,000 per year.

## **Conclusion**

The *£ for lb. Challenge* delivered important weight loss for many participants, particularly male workers. With high levels of user engagement and completion and successful multidisciplinary collaboration between public health, voluntary bodies, private and public companies it is a novel workplace based model with potential to expand.

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Ethical Approval: None required. This study was evaluation of a service, and therefore did not require Research Ethics Committee approval according to UK Health Research Authority guidance. Participants gave written informed consent to participation and to collection and analysis of information. In 2014, BITCNI collected fully identified data from participants and pseudonymised it before passing it to the Public Health Agency for analysis. In 2015 and 2016, champions maintained a participant database which was anonymised before being sent to BITCNI and onwards to PHA for analysis.

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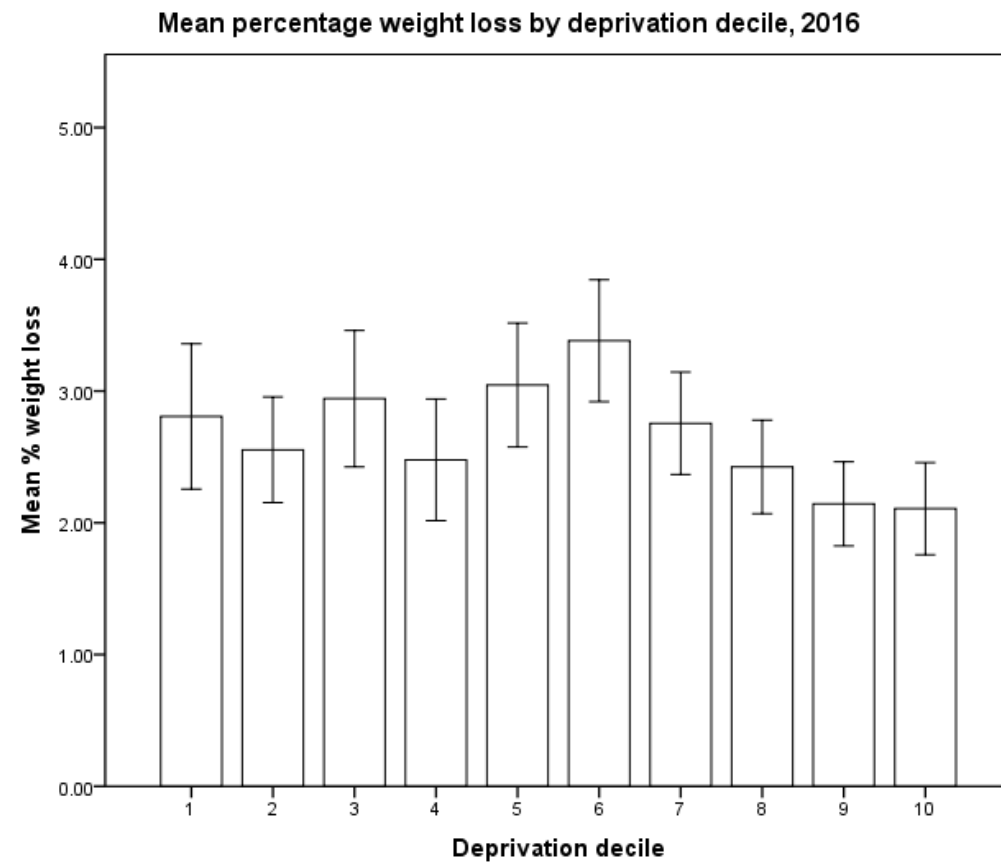
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**Figure 1. Mean percentage weight loss by deprivation decile, 2016**

	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>Eligible enrolled (n)</b>	734	1559	1513
<b>Male (%)</b>	316 (45.1%)	625 (42.2%)	579 (45.0%)
<b>Female (%)</b>	385 (54.9%)	856 (57.8%)	707 (55.0 %)
<b>Companies engaged</b>	21	31	35
<b>Mean Age (yrs) [SD]</b>	42.2 [9.9]	42.2 [10.1]	44.3 [9.7]
<b>Mean starting weight (kg) [SD]</b>	89.2 [16.5]	88.3 [16.4]	87.7 [15.3]
<b>Mean starting BMI (kg/m<sup>2</sup>) [SD]</b>	31.0 [4.6]	30.9 [4.7]	29.9 [6.1]

**Table 1. Baseline characteristics of participants.**

	2014	2015	2016
<b>Engaged; Completed; Attended 12 week session (n [%])</b>	NA; NA; 282 (39.4%)	1465 (94.0%) ; 1090 (69.9%) ; 1044 (67.0%)	1454 (96.1%) ; 1081 (71%) ; 989 (65%)
<b>Female</b>	NA; NA; 139 (36.1%)	801 (93.6%) ; 551 (64.4%); 524 (61.2%)	677 (96%) ; 442 (63%) ; 396 (56%)
<b>Male</b>	NA; NA; 140 (44.3%) <sup>NS</sup>	590 (94.4%) <sup>NS</sup> ; 495 (79.2%)*; 480 (76.8%)*	550 (95%) <sup>NS</sup> ; 456 (79%)* ; 427 (74%)*
<b>Mean weight change (kg) [SD]</b>	1.9 [3.5]	2.5 [3.2]	2.4 [3.1]
<b>Female (kg) [SD]</b>	1.3 [2.7]	1.8 [2.6]	1.6 [2.6]
<b>Male (kg) [SD]</b>	2.8 [4.1] * (p = 3.3 x 10 <sup>-8</sup> )	3.8 [3.7] * (p = 2.4 x 10 <sup>-28</sup> )	3.3 [3.4] * (p = 3.1 x 10 <sup>-22</sup> )
<b>Mean BMI change (kg/m<sup>2</sup>) [SD]</b>	0.67 [1.2]	0.87 [1.1]	0.81 [1.1]
<b>Female (kg/m<sup>2</sup>) [SD]</b>	0.50 [1.0]	0.67 [0.98]	0.60 [0.96]
<b>Male (kg/m<sup>2</sup>) [SD]</b>	0.92 [1.3] * (p = 5.1 x 10 <sup>-6</sup> )	1.20 [1.2] * (p = 2.3 x 10 <sup>-19</sup> )	1.06 [1.10] * (p = 3.1 x 10 <sup>-15</sup> )
<b>Mean % weight change (%) [SD]</b>	2.2 [3.8]	2.8 [3.4]	2.7 [3.4]
<b>Female (%) [SD]</b>	1.6 [3.2]	2.2 [3.1]	2.0 [3.2]
<b>Male (%) [SD]</b>	3.0 [4.3] * (p = 2.3 x 10 <sup>-6</sup> )	3.9 [3.7] * (p = 1.4 x 10 <sup>-19</sup> )	3.5 [3.6] * (p = 6.2 x 10 <sup>-15</sup> )

**Table 2. Numbers and proportions engaging, completing and attending the 12 week session for each year. Mean weight and BMI change and % weight change using BOCF method for each year.**

\* = significant difference between male and female (p< 0.05). <sup>NS</sup> = no significant difference between male and female (p>0.05).

	2014	2015	2016
<b>Completion - Odds ratios with 95% CIs.</b>		N = 1098 (770 completed).	n= 1286 (898 completed).
Male Sex	-	2.5 (1.9 – 3.3), p = 2.6 x 10 <sup>-11</sup>	2.2 (1.7 – 2.9), p = 4.2 x 10 <sup>-10</sup>
Age (years)	-	NS	NS
Baseline weight (kg)	-	0.989 (0.982 – 0.997), p = 0.006	NS
Baseline BMI (kg/m <sup>2</sup> )	-	NS	NS
NIMDM Decile	-	NS	NS
<b>% weight loss</b>			
Male Sex	2.3% (1.4% – 3.3%), p = 2.2 x 10 <sup>-6</sup>	1.7% (1.3% – 2.0%), p = 1.2 x 10 <sup>-20</sup>	1.4% (0.9% – 1.9%), p = 2.2 x 10 <sup>-9</sup>
Age (years)	NS	NS	NS
Baseline weight (kg)	NS	NS	NS
Baseline BMI (kg/m <sup>2</sup> )	NS	NS	NS
NIMDM Decile	NS	NS	0.08% (0.006% – 0.16%), p = 0.04
<b>≥ 5% weight loss - Odds ratios with 95% CIs</b>	N = 282 (147 lost ≥/5%)	n= 1098 (263 lost ≥/5%)	n= 1286 (328 lost ≥/5%)
Male Sex	3.7 (2.1 – 6.6), p = 9.5 x 10 <sup>-6</sup>	2.5 (1.9 – 3.2), p = 1.3 x 10 <sup>-13</sup>	2.7 (2.0 – 3.4), p = 1.7 x 10 <sup>-13</sup>
Age (years)	NS	NS	NS
Baseline weight (kg)	NS	NS	NS
Baseline BMI (kg/m <sup>2</sup> )	NS	NS	NS
NIMDM Decile	NS	NS	NS

**Table 3. Factors associated with completion (Logistic regression), % weight loss (Multivariate regression) and loss of ≥ 5% weight (Logistic regression). Odds ratios with 95% confidence intervals. NS = not significant.**